FORM PTO-1390 (Modified) (REV 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR
215270US2PCT	09/926393

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/JP00/01324	6 March 2000	none

TITLE OF INVENTION
TRANSMITTING-RECEIVING SHARED ANTENNA DEVICE

APPLICANT(S) FOR DO/EO/US
KAJIKAWA Hiroshi

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.
4. ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☒ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☒ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☐ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

Request for Consideration of Documents Cited in International Search Report
Drawings (4 Sheets)
PCT/IB/308

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/926393	PCT/JP00/01324	215270US2PCT

24. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

		CALCULATIONS PTO USE ONLY
☐	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO	$1040.00
☒	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO	$890.00
☐	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	$740.00
☐	International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)	$710.00
☐	International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4)	$100.00

ENTER APPROPRIATE BASIC FEE AMOUNT = $890.00

Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)). $0.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	6 - 20 =	0	x $18.00	$0.00
Independent claims	4 - 3 =	1	x $84.00	$84.00
Multiple Dependent Claims **(check if applicable)**.			☐	$0.00

TOTAL OF ABOVE CALCULATIONS = $974.00

☐ Applicant claims small entity status. See 37 CFR 1.27). The fees indicated above are reduced by 1/2. $0.00

SUBTOTAL = $974.00

Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). + $0.00

TOTAL NATIONAL FEE = $974.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☐ $0.00

TOTAL FEES ENCLOSED = $974.00

Amount to be: refunded	$
charged	$

a. ☒ A check in the amount of **$974.00** to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **15-0030** A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Surinder Sachar
Registration No. 34,423

22850

Surinder Sachar
SIGNATURE

Marvin J. Spivak
NAME

24,913
REGISTRATION NUMBER

Oct. 25 2001
DATE

SPECIFICATION

TRANSMITTING-RECEIVING SHARED ANTENNA DEVICE

This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/JP00/01324 which has an International filing date of March 6, 2000, which designated the United States of America and was not published in English.

TECHNICAL FIELD

The present invention relates to a transmitting-receiving shared antenna device that is used in a portable terminal for satellite communication and terrestrial communication.

BACKGROUND ART

Fig. 4 depicts a conventional transmitting-receiving antenna device for portable terminal use. In Fig. 4, reference numeral 1 denotes a four-wire transmitting helical antenna which provides circular polarization, and 2 a four-wire receiving helical antenna which also provides circular polarization. Reference numeral 3 denotes a divider for feeding to the transmitting helical antenna 1, and 4 a transmitter formed by a high output amplifier or the like which outputs a transmission signal. Reference numeral 5 denotes a combiner for combining signals received by the receiving helical antenna 2, and 6 a receiver formed by a low noise amplifier or the like.

A description will be given of the transmitting-receiving operation by the conventional transmitting-receiving antenna device. The transmission signal of the transmitting system is subjected to operations for the removal of

unwanted waves and high output amplification in the transmitter 4, thereafter being input to the divider 3. This transmission signal is divided by a delay operation of the divider 3 to four signals of phase differences 0°, 90°, 180° and 270°, which are input to the four-wire transmitting helical antenna 1. Now, let it be assumed that the line lengths of four feeders from four output ends of the divider 3 to the transmitting helical antenna 1 are the same and that respective antenna elements of the transmitting helical antenna 1 have the same line length. Letting the wavelength of the transmission wave be represented by λ_1, the lengths of the respective antenna elements are each set to any one of $\lambda_1/4$, $3\lambda_1/4$, ..., by which the antenna elements are allowed to resonate at a transmitting frequency and hence transmit circularly polarized wave signals of the above-mentioned phases. And the combiner 5 in the receiving system combines circularly polarized wave signals received by the four wires of the receiving helical antenna 2 with the phase differences 0°, 90°, 180° and 270°. Letting the wavelength of the received wave be represented by λ_2, the lengths of the respective antenna elements of the receiving helical antenna 2 are each set to any one of $\lambda_2/4$, $3\lambda_2/4$, ..., by which the antenna elements are allowed to resonate at a receiving frequency and hence receive circularly polarized wave signals of the above-mentioned phase differences.

When the transmitting and receiving frequencies are different from but close each other, it is possible to construct a transmitting and receiving shared helical antenna which has a gain in a band common to both of the transmission and reception. However, when the transmitting and receiving frequencies are apart from each other or when it is desirable to optimize the gain in transmission and reception, it is necessary to use two different helical antennas for transmission and reception and set the lengths of antenna elements of each helical antenna to physical sizes that match the transmitting

or receiving frequency.

Nowadays various terrestrial cellular telecommunication systems and satellite-portable telephone systems using artificial satellites have been developed, and a dual mode or multi mode portable terminal has also been developed which is capable of communicating with plural communication services. The frequencies of radio waves for transmission and reception by portable terminals are determined for each communication system; for example, in the case of a portable terminal for transmission to and reception from two communication systems, it is necessary to use antennas corresponding to four frequencies for transmission and reception.

As described above, in the case of the conventional antenna device for portable terminal use, when the transmitting and receiving frequencies are not close to each other or when the antenna gain is optimized, it is necessary to provide helical antennas for transmission and reception, respectively--this gives rise to the problem of the portable terminal becoming bulky. Furthermore, the portable terminal for transmission to and reception from plural communication systems also requires plural helical antennas for communication, raising the same problem that the portable terminal becomes inevitably bulky.

The present invention is intended to solve the above-mentioned problems and provide a transmitting-receiving shared antenna device for portable terminals which is formed by a helical antenna for use in common to plural radio waves of different frequencies.

DSICLOSURE OF THE INVENTION

A transmitting-receiving shared antenna device according to an aspect of the present invention comprises: a helical antenna for use in common to

transmission and reception; varactor diodes each provided in one of feeders to antenna elements of the helical antenna; and bias voltage switching means for switching a reverse bias voltage to be applied to the varactor diode between transmission and reception to switch between frequency bands of signals for transmission and reception by the helical antenna. Accordingly, it is possible to switch between resonance frequencies of the helical antenna for transmission and reception, providing enhanced frequency characteristics of the antenna during transmission and reception.

The varactor diode has its cathode side connected to the antenna element side of the helical antenna, and the bias voltage switching means may be one that applies the reverse bias voltage via a resistor connected to the cathode side of the varactor diode. With this construction, the resistor interposed between the feeder and the voltage input terminal increases the impedance of the voltage input terminal side, permitting reduction of losses of transmission and received signals that propagate through the feeder.

Furthermore, the varactor diode has its cathode side connected to the antenna element side of the helical antenna, and the bias voltage switching means may be one that applies the reverse bias voltage via a coil connected to the cathode side of the varactor diode. With this construction, the coil interposed between the feeder and the voltage input terminal allows matching between the voltage input terminal side and the helical antenna, permitting reduction of losses of transmission and received signals that propagate through the feeder.

A transmitting-receiving shared antenna device according to another aspect of the present invention comprises: a four-wire helical antenna for use in common to transmission and reception of circularly polarized wave signals; a divider/combiner for generating four signals divided from a transmission

signal, for phasing the four divided signal apart by a first delay line, and for combining received signals from the helical antenna via a second delay line; varactor diodes each provided between the helical antenna and the divider/combiner; and bias voltage switching means for switching a reverse bias voltage to be applied to the varactor diode between transmission and reception to switch between frequency bands of signals for transmission and reception by the helical antenna. Accordingly, for the helical antenna that is used in common to transmission and reception of circularly polarized wave signals, too, it is possible to switch the resonance frequencies between transmission and reception, providing enhanced frequency characteristics of the antenna during transmission and reception.

A transmitting-receiving shared antenna device according to another aspect of the present invention comprises: a four-wire helical antenna for use in common to transmission and reception of circularly polarized wave signals; a divider/combiner for generating four signals divided from a transmission signal, for phasing the four divided signal apart by a delay line, and for combining received signals from the helical antenna via the delay line; four varactor diodes each provided between one of antenna elements of the helical antenna and the divider/combiner; and bias voltage switching means for switching a reverse bias voltage to be applied to the varactor diode between transmission and reception to switch between frequency bands of signals for transmission and reception by the helical antenna. Accordingly, for the helical antenna that is used in common to transmission and reception of circularly polarized wave signals, too, it is possible to switch the resonance frequencies between transmission and reception, providing enhanced frequency characteristics of the antenna during transmission and reception.

A transmitting-receiving shared antenna device according to still

another aspect of the present invention comprises: a helical antenna for use in common to transmission and reception; varactor diodes each provided between one of feeders to antenna elements of the helical antenna and a grounding point; and bias voltage switching means for switching a reverse bias voltage to be applied to the varactor diode between transmission and reception to switch between frequency bands of signals for transmission and reception by the helical antenna. Accordingly, it is possible to switch between resonance frequencies of the antenna for transmission and reception by matching between the varactor diodes and the helical antenna, providing enhanced frequency characteristics of the antenna during transmission and reception.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram illustrating the configuration of the transmitting-receiving shared antenna device according to the present invention (Embodiment 1).

Fig. 2 is a block diagram illustrating the configuration of the transmitting-receiving shared antenna device according to the present invention (Embodiment 2).

Fig. 3 is a block diagram illustrating the configuration of the transmitting-receiving shared antenna device according to the present invention (Embodiment 3).

Fig. 4 is a block diagram showing the configuration of a conventional antenna device.

BEST MODE FOR CARRYING OUT THE INVENTION

EMBODIMENT 1

Fig. 1 is a block diagram depicting the configuration of the transmitting-receiving shared antenna device according to Embodiment 1 of the present invention. Reference numeral 7 denotes a helical antenna shared between transmission and reception, and 8 a varactor diode set on each feeder to the helical antenna 7. The varactor diode 8 is set for each antenna element of the helical antenna 7 and is series-connected with its cathode on the side of the antenna element. Reference numeral 9 denotes a first voltage input terminal, 10 a second voltage input terminal, and 11 a switch for switching between the voltage input terminals 9 and 10. Reference numeral 12 denotes a resistor connected to the cathode side of the varactor diode 8, the resistor being connected at the other end to the switch 11. Reference numeral 14 denotes a divider/combiner for feeding to the helical antenna 7, 15 a circulator, 16 a transmitter formed by a high output amplifier or the like, and 17 a receiver formed by a low noise amplifier or the like.

A transmission signal is subjected to the removal of unwanted waves and high output amplification, and input to the divider/combiner 14 via the circulator 15. The circulator 15 prevents the transmission signal from sneaking in the receiver 17. The transmission signal is divided by the divider/combiner 14 to a required of feeding signals according to the number of antenna elements of the helical antenna 7, and they are fed via feeders to the helical antenna 7. Fig. 1 shows the case where the transmission signal is divided to four signals. On the other hand, received signal from the helical antenna 7 are combined by the divider/combiner 14, then the combined signal is provided via the circulator 15 to the receiver 17, wherein it is subjected to low noise amplification or the like, and the amplified signal is input to a signal processing part or the like not shown. The circulator 15 prevents the received signal from sneaking in the transmitter 16.

The transmission signals divided by the divider/combiner 14 are fed via the varactor diodes 8 to the respective antenna elements of the helical antenna 7. Across the anode and cathode of each varactor diode 8 is applied a reverse bias voltage from the voltage input terminal 9 or 10 via the switch 11. The condenser capacitance of the varactor diode 8 varies with the value of this reverse bias voltage. The resonance frequency of the helical antenna 7 is dependent on the condenser capacitance of the varactor diode 8 and the electrical length of each antenna element of the helical antenna 7, and accordingly, the resonance frequency varies as the condenser capacitance varies. By setting different voltages to be applied from the voltage input terminals 9 and 10 and switching between them by the switch 11, it is possible to construct an antenna that resonates to different frequencies for transmission and reception. The switch 11 is so actuated, for example, as to apply therethrough a reverse bias voltage from the voltage input terminal 9 to the varactor diode 8 during a transmission gate period and a reverse bias voltage from the voltage input terminal 10 to the varactor diode 8 during a receiving gate period. At the time of reception, too, the resonance frequency for reception by the antenna is dependent on the reverse bias voltage applied across the anode and cathode of the varactor diode 8 from the voltage input terminal 10 as in the case of transmission. The signals received by the helical antenna 7 are combined by the divider/combiner 14, thereafter being input via the circulator 15 to the receiver 17.

In this example, the resistor 12 is used to supply the reverse bias voltage to the varactor diode 8 and provide impedance sufficiently higher than that of the transmission line to reduce signal losses. The resistor 13 is used to ground the anode side of the varactor diode 8 to provide a potential difference between its anode and cathode and provide impedance sufficiently

higher than that of the transmission line to reduce signal losses.

While in Fig. 1 the resistors 12 and 13 are used in the voltage supply circuit for applying the reverse bias voltage to the varactor diode 8, they may be replaced with coils. With the use of coils, it is possible to provide matching between the voltage supply circuit for the bias application and the anode grounding circuit and each antenna element of the helical antenna, permitting enhancement of the antenna radiation efficiency. The voltage supply circuit mentioned herein is a circuit composed of the voltage input terminals 9 and 10, the switch 11 and the resistor 12, and the anode grounding circuit is a circuit formed by the resistor 13.

Incidentally, Fig. 1 shows the case in which the helical antenna 7 is four-wire one, and even if this helical antenna 7 is a two-wire one, this embodiment can similarly be constructed by the above-described circuitry. The use of the two-wire helical antenna decreases the number of antenna elements, and hence decreases the number of varactor diodes 8 connected to the antenna elements, permitting miniaturization of the antenna device.

EMBODIMENT 2

Fig. 2 is a block diagram illustrating the configuration of a transmitting-receiving shared antenna device according to Embodiment 2 of the present invention. In Fig. 2, reference numeral 18 a divider/combiner containing built-in delay circuits, which is shown to have a delay circuit for producing signals of phases 0°, 90°, 180° and 270°. The other circuits identified by the same reference numerals as those in Fig. 1 are the same or corresponding circuits or parts in Embodiment 1 of Fig. 1.

This embodiment is characterized in that, as described above, the transmission signal to be fed to the helical antenna 7 is divided by the

divider/combiner 18 to four signals of the phase differences 0°, 90°, 180° and 270° to generate circularly polarized waves. And this embodiment is further characterized in that the received signals are combined by the divider/combiner 18 provided with the delay circuits that provides the above-mentioned phase differences. In the case of using different frequencies for transmission and reception, when the divider/combiner 18 has circuits which provide such phase differences, for example, when the delay circuits are provided according to the frequencies for transmission, the signals to be combined do not become in-phase because their frequencies differ from those for transmission--this causes a phase error in the received signal.

In the helical antenna device of the type transmitting and receiving circularly polarized wave signal, the phase error in the transmission and reception due to the delay circuits could be reduced by separately providing in the divider/combiner 18 delay lines for the passage therethrough of the transmission signal and delay lines for the passage therethrough of the received signal. Such a configuration inevitably makes bulky the delay circuit in the divider/combiner 18, but solves the problem of phase error.

Further, in the case of sharing the delay lines for the passage of the transmission and received signals with a view to preventing the delay circuit in the divider/combiner 18 from becoming bulky, the phase error between the transmission and received signals can be reduced by applying a different reverse bias voltage to the varactor diode 8 for each antenna element. The delay circuit in the divider/combiner 18 is shared between the transmission and reception, and is formed by delay lines which provide phase differences 0°, 90°, 180° and 270° for either one of the transmission and received signals, for example, for the transmission signal. Accordingly, when the received signals combined using these delay lines are not in phase because the

frequencies of the transmission and received signals differ. To correct the phase shift, the reverse bias voltages to be applied to the four varactor diodes corresponding to the antenna elements of the helical antenna 7 are set to different values and the condenser capacitances of the four varactor diodes 8 are chosen different. In the above example, since the delay circuit is provided so that the four phase differences are 0°, 90°, 180° and 270° during transmission, the reverse bias voltage during transmission, for example, the values at the voltage input terminals 9 are set to the same value for the four varactor diodes 8. During reception the values at the four voltage input terminals 10 to be applied to the four varactor diodes are set to different values.

When the condenser capacitances of the varactor diodes are set to different values for the respective antenna elements of the helical antenna 8, the resonance frequency somewhat shifts. This embodiment makes the shift of the resonance frequency smaller than in the case of transmitting and receiving signals of different frequencies without changing the condenser capacitances of the varactor diodes 8.

EMBODIMENT 3

Fig. 3 is a block diagram illustrating the configuration of a transmitting-receiving shared antenna according to Embodiment 3 of the present invention. In Fig. 3, reference numeral 19 denotes capacitive elements each connected in series to the feeder to the helical antenna 7. Reference numeral 20 denotes varactor diodes each connected to the feeder and the grounding point. The other circuits identified by the same reference numerals as those in Fig. 1 are the circuits or parts identical with or corresponding to those in Embodiment 1 of Fig. 1.

Across the cathode and anode of the varactor diode 20 is applied the reverse bias voltage from either of the voltage input terminals 9 and 10 via the switch 11. The condenser capacitance of the varactor diode 20 varies with the reverse bias voltage, and by matching between the condenser capacitance and each antenna element of the helical antenna 7, the resonance frequency of the antenna changes, making it possible to change the transmitting frequency or receiving frequency.

CLAIM

1. A transmitting-receiving shared antenna device, comprising:

a helical antenna for use in common to transmission and reception;

varactor diodes each provided in one of feeders to antenna elements of the helical antenna; and

bias voltage switching means for switching a reverse bias voltage to be applied to the varactor diode between transmission and reception to switch between frequency bands of signals for transmission and reception by said helical antenna.

2. The transmitting-receiving shared antenna device according to claim 1, wherein said each varactor diode has its cathode side connected to the antenna element side of said helical antenna, and said bias voltage switching means applies the reverse bias voltage via a resistor connected to the cathode side of said varactor diode.

3. The transmitting-receiving shared antenna device according to claim 1, wherein said each varactor diode has its cathode side connected to the antenna element side of said helical antenna, and said bias voltage switching means applies the reverse bias voltage via a coil connected to the cathode side of said each varactor diode.

4. A transmitting-receiving shared antenna device, comprising:

a four-wire helical antenna for use in common to transmission and reception of circularly polarized wave signals;

a divider/combiner for generating four signals divided from a transmission signal, for phasing said four divided signals apart by a first delay line, and for combining received signals from said helical antenna via a second delay line;

varactor diodes each provided between said helical antenna and said divider/combiner; and

bias voltage switching means for switching a reverse bias voltage to be applied to the varactor diode between transmission and reception to switch between frequency bands of signals for transmission and reception by said helical antenna.

5. A transmitting-receiving shared antenna device, comprising:

a four-wire helical antenna for use in common to transmission and reception of circularly polarized wave signals;

a divider/combiner for generating four signals divided from a transmission signal, for phasing said four divided signals apart by a delay line, and for combining received signals from said helical antenna via said delay line;

four varactor diodes each provided between one of antenna elements of said helical antenna and said divider/combiner; and

bias voltage switching means for switching a reverse bias voltage to be applied to said each varactor diode between transmission and reception to switch between frequency bands of signals for transmission and reception by said helical antenna.

6. A transmitting-receiving shared antenna device, comprising:

a helical antenna for use in common to transmission and reception;

varactor diodes each provided between one of feeders to antenna elements of the helical antenna and a grounding point; and

bias voltage switching means for switching a reverse bias voltage to be applied to the varactor diode between transmission and reception to switch between frequency bands of signals for transmission and reception by said helical antenna.

FIG.1

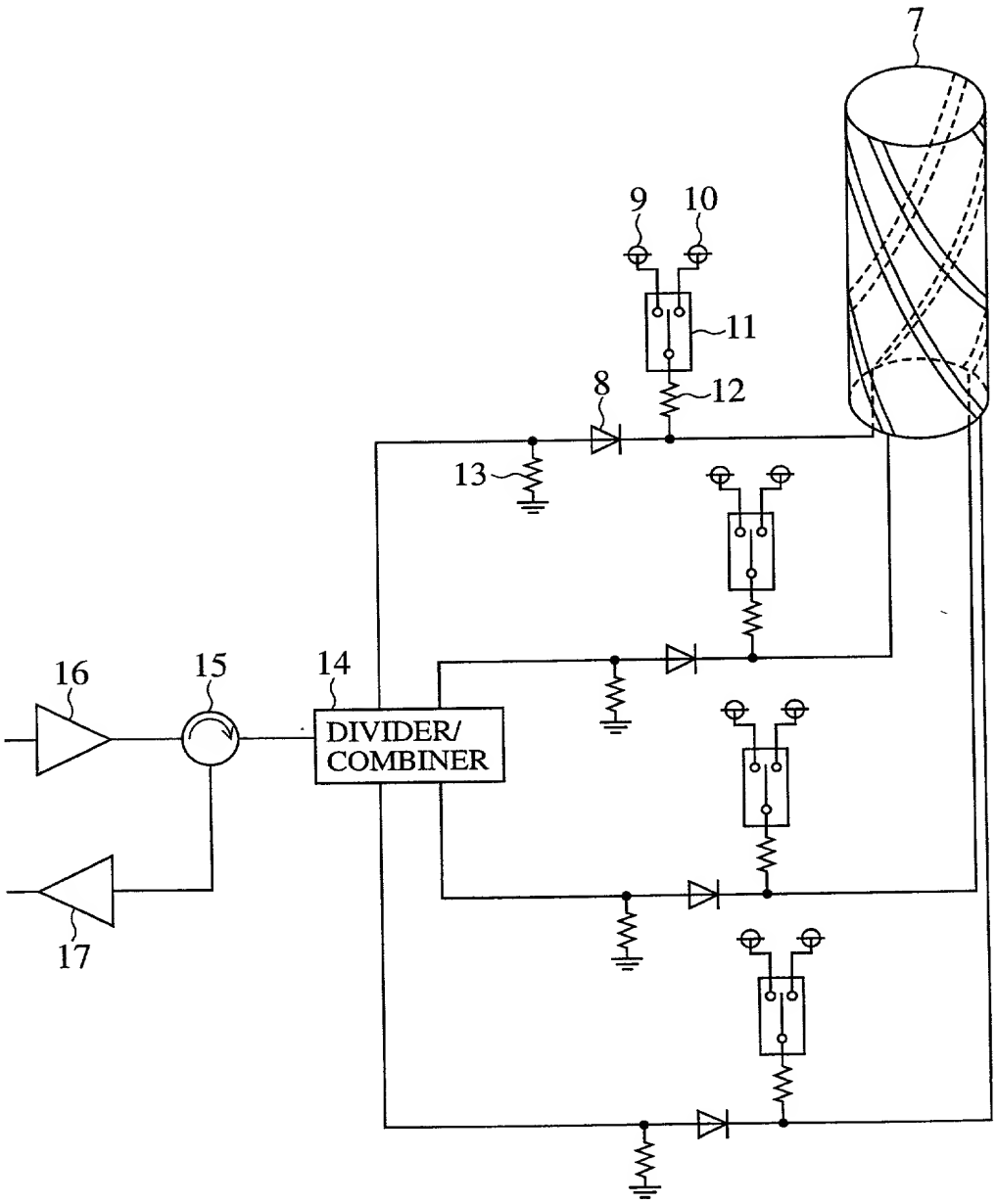


FIG.2

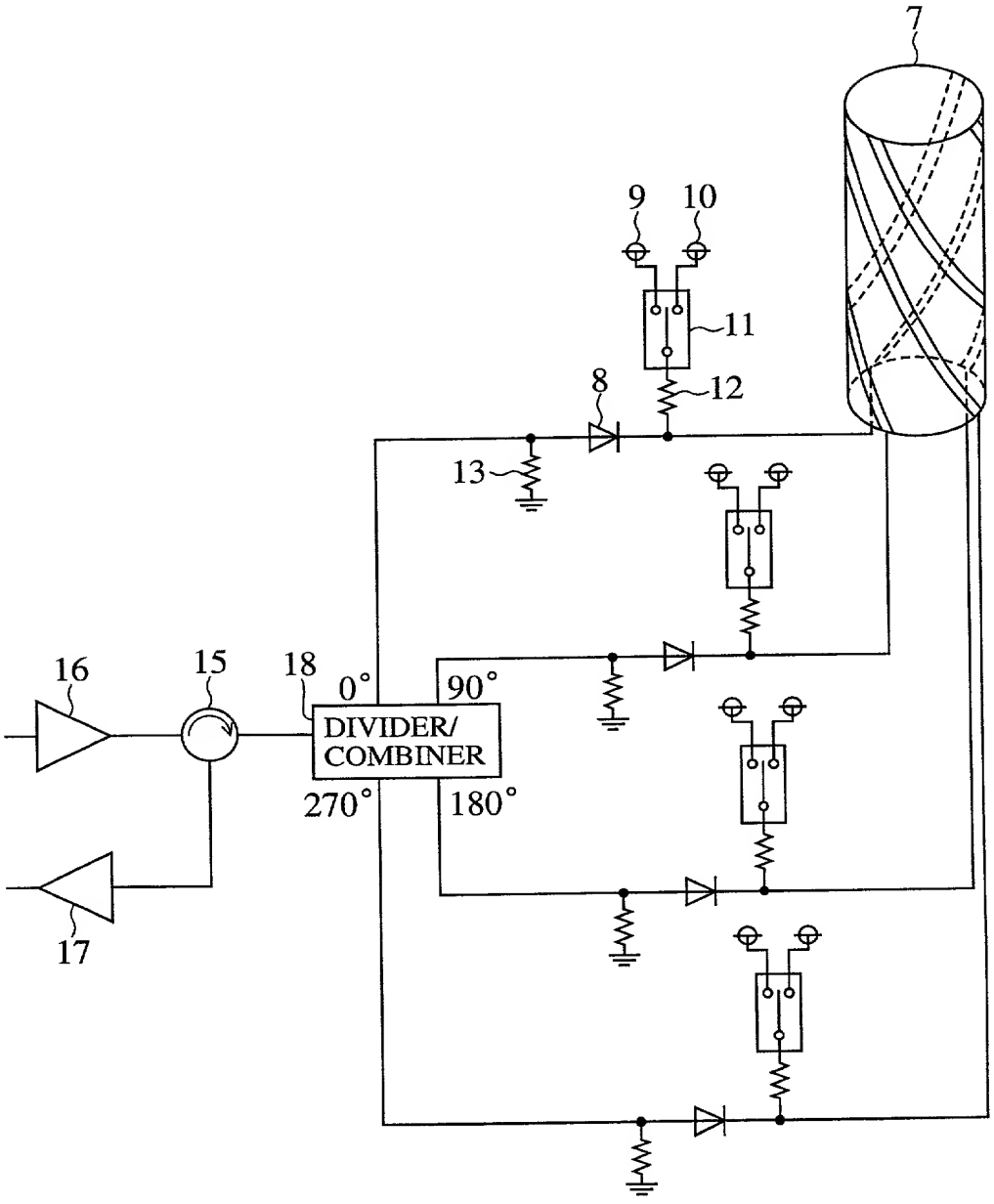


FIG.3

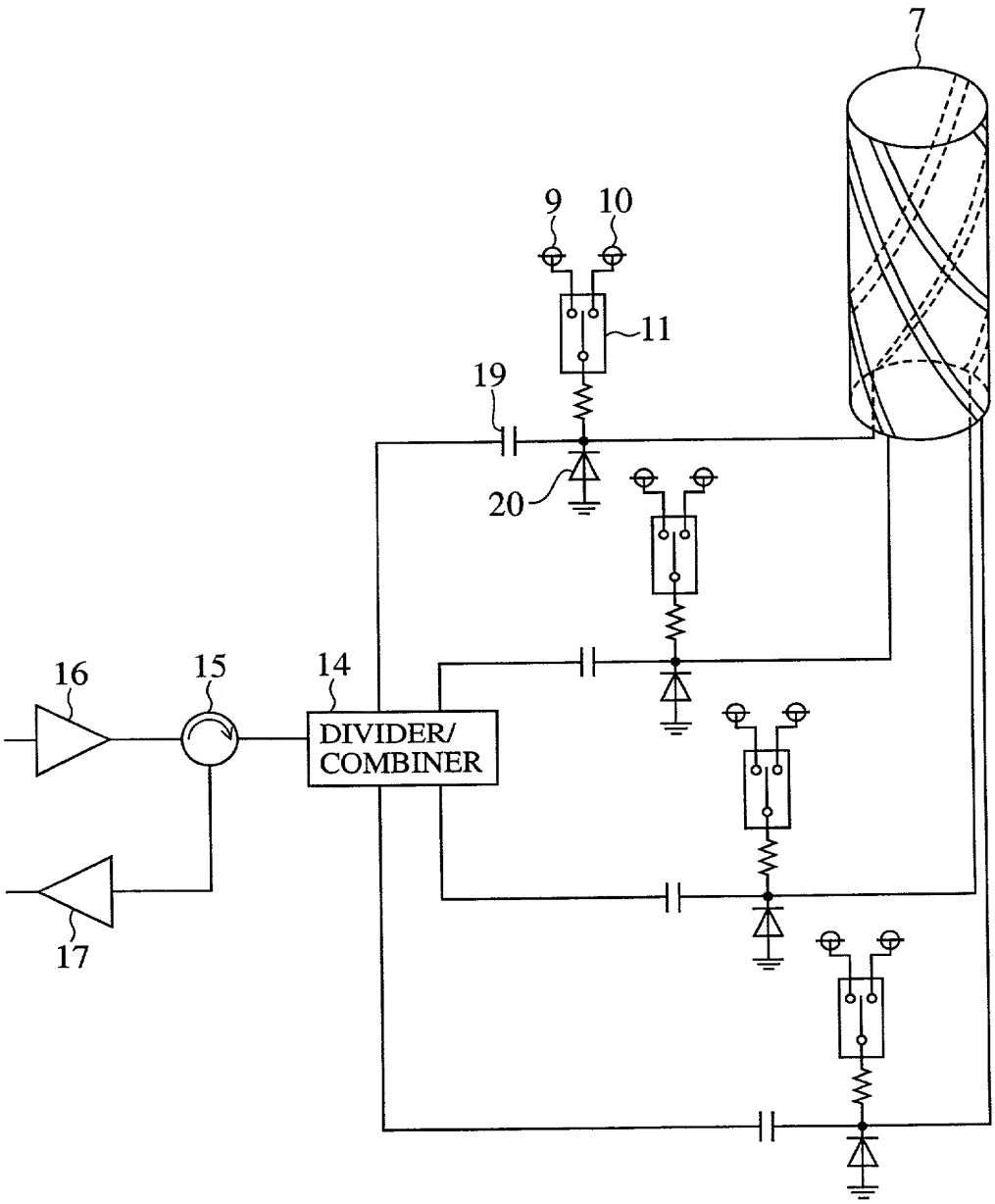
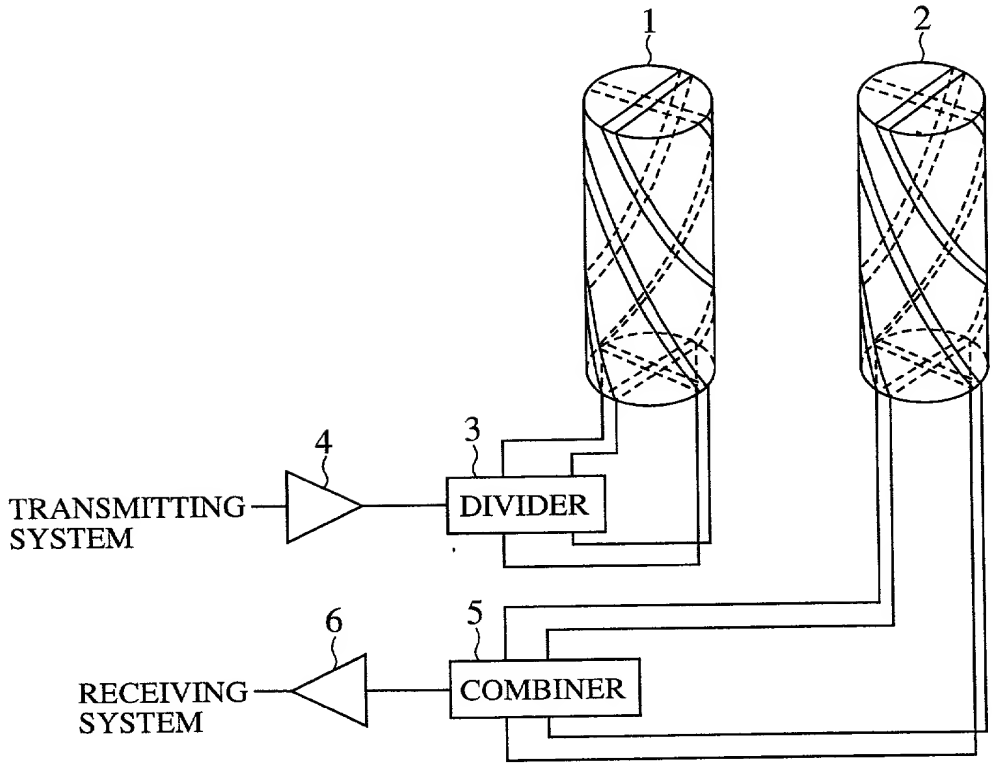


FIG.4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TRANSMITTING SYSTEM
DIVIDER
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6
RECEIVING SYSTEM
COMBINER

Declaration and Power of Attorney For Patent Application

特許出願宣言書及び委任状

Japanese Language Declaration

日本語宣言書

下記の氏名の発明者として、私は以下の通り宣言します。

As a below named inventor, I hereby declare that:

私の住所、私書箱、国籍は下記の私の氏名の後に記載された通りです。

My residence, post office address and citizenship are as stated next to my name.

下記の名称の発明に関して請求範囲に記載され、特許出願している発明内容について、私が最初かつ唯一の発明者（下記の氏名が一つの場合）もしくは最初かつ共同発明者（下記の名称が複数の場合）であると信じています。

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled.

"TRANSMITTING-RECEIVING SHARED ANTENNA DEVICE"

上記発明の明細書は、

- ☐ 本書に添付されています。
- ☐ ___月___日に提出され、米国出願番号または特許協定条約国際出願番号を_____とし、
  （該当する場合）_____に訂正されました。

the specification of which

- ☐ is attached hereto.
- ☒ was filed on March 6, 2000
  as United States Application Number or
  PCT International Application Number
  PCT/JP00/01324 and was amended on
  _____ (if applicable).

私は、特許請求範囲を含む上記訂正後の明細書を検討し、内容を理解していることをここに表明します。

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第37編第1条56項に定義されるとおり、特許資格の有無について重要な情報を開示する義務があることを認めます。

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Japanese Language Declaration
(日本語宣言書)

私は、米国法典第35編119条（a）-（d）項又は365条（b）項に基づき下記の、米国以外の国の少なくとも一ヵ国を指定している特許協力条約365（a）項に基づく国際出願、又は外国での特許出願もしくは発明者証の出願についての外国優先権をここに主張するとともに、優先権を主張している、本出願の前に出願された特許または発明者証の外国出願を以下に、枠内をマークすることで、示しています。

I hereby claim foreign priority under Title 35, United States Code, Section 119 (a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)
外国での先行出願

(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願年月日)	Priority Claimed 優先権主張	
			☐ Yes はい	☐ No いいえ
			☐ Yes はい	☐ No いいえ

私は、第35編米国法典119条（e）項に基づいて下記の米国特許出願規定に記載された権利をここに主張いたします。

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application No.) (出願番号)	(Filing Date) (出願日)

私は、下記の米国法典第35編120条に基づいて下記の米国特許出願に記載された権利、又は米国を指定している特許協力条約365条（c）に基づく権利をここに主張します。また、本出願の各請求範囲の内容が米国法典第35編112条第1項又は特許協力条約で規定された方法で先行する米国特許出願に開示されていない限り、その先行米国出願書提出日以降で本出願書の日本国内または特許協力条約国際提出日までの期間中に入手された、連邦規則法典第37編1条56項で定義された特許資格の有無に関する重要な情報について開示義務があることを認識しています。

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of application.

(Application No.) (出願番号)	(Filing Date) (出願日)	(Status: Patented, Pending, Abandoned) (現況：特許許可済、係属中、放棄済)

私は、私自信の知識に基づいて本宣言書中で私が行なう表明が真実であり、かつ私の入手した情報と私の信じるところに基づく表明が全て真実であると信じていること、さらに故意になされた虚偽の表明及びそれと同等の行為は米国法典第18編第1001条に基づき、罰金または拘禁、もしくはその両方により処罰されること、そしてそのような故意による虚偽の声明を行なえば、出願した、又は既に許可された特許の有効性が失われることを認識し、よってここに上記のごとく宣誓を致します。

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Japanese Language Declaration
(日本語宣言書)

委任状：私は下記の発明者として、本出願に関する一切の手続きを米特許商標局に対して遂行する弁理士または代理人として、下記の者を指名いたします。
(弁護士、または代理人の指名及び登録番号を明記のこと)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: *(list name and registration number)*

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(Supply similar information and signature for third and subsequent joint inventors.)